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SESSION 1945–46.

AT THE ORDINARY GENERAL MEETING

Held at the Chartered Surveyors' Institution on Monday, 6th May, 1946.

Mr. E. B. GILLETT (*President*) in the Chair.

NEW MEMBERS.

The following members were received by the President prior to the meeting and signed the Register :—

Fellow :

GILBY, HORACE ERNEST.

Professional Associates :

BRYANT, ARTHUR JOHN
BURGE, LEONARD HENRY
COOKE, SIDNEY GEORGE
GILLAM, ALBERT GEORGE
HEASMAN, HENRY ROBERT
WOOLDRIDGE, FRANK DOUGLAS

The following Paper was read by Colonel A. R. MAIS, O.B.E., T.D. (Fellow).

Paper No. 598.

SOME WAR EXPERIENCES OF A CHARTERED SURVEYOR.

It is impossible for any one man to attempt to cover all aspects of a surveyor's work in war, or even, for that matter, in the Corps of Royal Engineers, therefore, this address has been confined to the works and operations with which I have been personally connected ; in particular the work on the Trans-Persian Railway and Mulberry. The address has been prepared in chronological order, starting with 1939–40 operations in France and Belgium and travelling by way of Egypt, Iraq, Persia and Normandy to Berlin.

First British Expeditionary Force

There is little to recount of this campaign which has not already been written. The work of the Engineers was confined throughout the winter and early spring to the construction of a defence line on the Franco-Belgian frontier (a defence line which was never used), road and aerodrome construction, large base depots, railway installations and improving port facilities. In fact, all the preparations necessary for a long stay on the continent.

War started for us, just as we were completing a large Engineer Stores Depot, when orders were received early in the morning to move forward, as the Germans had broken through and certain vital railway and road bridges had been blown by our own engineers in error, trapping large forces and some hospital trains on the wrong side of the river. In all, six bridges were restored in thirty-six hours, they remained open for a further twenty-four hours during which time, large numbers of troops and the trains crossed, they were then blown up for the second time. The rest of this campaign was one of destruction and disillusion, but not despair. Most engineers took over the role of infantry at one stage or another which, if it served no other useful purpose, made us very glad to get back to engineering.

United Kingdom 1940–1941

Many jobs were undertaken by engineers during this period. I think possibly we had one of the most interesting, for after a period in Scotland, we were sent to the Shropshire and Montgomery Railway, a disused line running from Shrewsbury to the borders of Wales. The line had not been in operation for many years, mainly due to the fact that the two bridges across the Severn River had been seriously damaged by ice some ten years before the war. The object was to restore this line, build large new marshalling yards, construct ammunition sheds and sidings, as it was to be the main ammunition depot for Western Command in the event of invasion. With regard to the bridges, a survey had to be made and a scheme prepared for their repair, detailed drawings of all new steelwork had to be made, contracts fixed for the fabrication, and finally the steelwork collected from the works and fixed. While the repairs to the two main bridges and some twenty or more small bridges were in progress some 40 miles of main line had to be reinstated and some 90 miles of new sidings and spurs constructed.

Middle East, Persia, etc., 1941–1943

In 1941, the sphere of activities moved to Middle East and Persia, the object being the invasion of Persia by Russian and British forces, to secure the railway running from the Persian Gulf to the Caspian Sea. A small party of officers, very ineffectively disguised as civilians, were flown via Lisbon to Basra in time to reach Teheran with the leading troops. Construction companies were following by sea. It was, therefore, necessary to contend with a five-months period with no British engineer troops available. This was not helped by the companies being diverted to Singapore, and it was not until seven months after the arrival of the engineer reconnaissance party that the first companies arrived.

The staff available consisted of one construction officer and two operating officers. The civilian organisation of the Persian railway was not good. The engineering side was better off than most in that it had a small number of Scandinavian engineers in key posts, but unfortunately a number of these were known to be pro-Nazi, which did not make matters easier.

The line in the British sector was some 740 miles from the Gulf to Teheran. The first task was to re-organise the engineering staff and then to consider how the line capacity could be increased from one train per day (if convenient) to twelve trains a day (whether convenient or not). I will not deal with the operating problem. The main engineering problem was, that when the railway was built in 1935–1939, it had been considered almost impossible to construct passing stations in certain mountain sections ; some sections, therefore, were so long that the maximum number of trains which could be worked per day was six and it became necessary that no matter what the difficulties, additional passing stations had to be constructed. This was eventually done.

At this stage, it was necessary to get all work carried out by local contractors, under the supervision of military engineers. Luckily the engineering staff received 100 per cent. increase at Christmas, with the arrival of another chartered surveyor.(1) The total construction staff now numbered two.

By December, 1941, maintenance and construction work on the main line was beginning to become organised. However, just before Christmas two orders were received on the same day, one to prepare a complete and detailed demolition scheme for the railway from the Caspian Sea to the Gulf, and two, to construct with all speed, a new railway line from Ahwaz to Khoramshar, some 100 miles in length across a desert subject to serious flooding from the Karun river. It was pointed out that we had no troops, the answer received was " We know, neither has anyone else, but nevertheless, the demolition scheme must be prepared and the new line built."

It was, therefore, decided to deal with the demolitions first. This involved a 750 miles journey in mid-winter on an open diesel railcar from the Gulf to Teheran (the line rose in places to 8,000 ft. above sea level) and calculations for the destruction of some 120 bridges and 119 tunnels had to be made.

It was during this trip that we nearly lost our total construction staff of two. For while resting one night in the mountain section in a native rest house, some of the local tribesmen came into the rooms occupied by the sleeping reconnaissance party, shut the windows, closed the doors, blocked up all the airholes with rugs and then put five open charcoal braziers in the room. Luckily, one of the party woke whilst he still had sufficient strength to reach a window and, in falling unconscious, smashed it.

Ahwaz—Khoramshar Line

On completion of the demolition, reconnaissance work was started on the Ahwaz to Khoramshar Line and it was decided to carry out a location survey of three alternative routes. Profiles were prepared for each, and the best route selected.

The line commenced at Ahwaz which was the highest navigable point on the Karun River. A " take off " was made at the south end of the yard and run towards the Lashkarabad to avoid bad ground and then headed west-south-west across the desert for a total distance of 140 kilometres. It was a single line, with four crossing stations. It was built to standard gauge and laid in American rails. This track was available in Persia, being a consignment intended for use on the Tabriz line.

Construction—Construction Camp, etc.

Work was commenced in December, 1941, and a construction camp and permanent way stores depot established. At the time that it became necessary to put this work in hand, no railway construction companies had arrived in Persia and it, therefore, became necessary to use local resources.

(1) Major K. H. Blessley, M.B.E., M.A. (Professional Associate).

The A.G.D.C. a Persian Government department responsible for the construction of railways and roads was called in to assist in the provision of engineers, etc., to supervise the work on site.

It was decided to divide the work up as follows, and to call for tenders :—

(i) *Earthwork*—Lot 1. From Ahwaz to Kilometre 70.
(ii) ,, Lot 2. From Kilometre 70 to Khoramshar.
(iii) *Bridges*—Superstructure only.

The track laying was to be carried out by a permanent-way gang, provided by the Persian railway. All bridge abutments, piers and culverts formed part of the earthwork contracts.

The responsibility for general supervision, checking of all designs, and plans, passing and checking of all measurements and accounts and inspection of works remained the responsibility of the military engineers. Detailed bills of quantities were prepared by us, tenders were invited, and a start made on the earthwork in December.

Earthwork

The route chosen was almost flat and in certain sectors was liable to flooding. The height of the embankment varied from 2 feet 6 inches minimum to 5 feet maximum and a width of 14 feet 6 inches.

The height of 2 feet 6 inches was approximately 1 foot below the minimum laid down the by Persian State Railways and pressure was brought to bear on us to conform to their regulations, but as this would have seriously delayed progress and greatly increased the cost, it was decided that we could not agree. We did, however, build all bridges, etc., up to Persian standard, in order that they might raise the bank after the war should they so desire.

Progress on Lot 1 was good and earthwork was always 5 to 6 kilometres in advance of railhead, but on Lot 2 the main contractor sub-let without permission and his sub-contractor (who was a fruit exporter !) made very bad going indeed, particularly in connection with his bridge abutment and pier work. In order to avoid delaying the platelaying party it became necessary to sanction a deviation round bridges which remained unfinished. The cost involved by this additional work, was deducted from the contractor's account on completion, together with a penalty for his breach of contract in sub-letting without sanction. It also became necessary to take over all bridge work at the Khoramshar jetty from this contractor.

The labour on the earthwork moved forward daily and was accommodated in tents or huts formed of Chatti (matting). The watering of labour was a problem and this was finally got over by mounting cisterns in open lorries.

The contractors also experienced great difficulty in feeding their labour. Wheat was not obtainable through the normal local authority and had to be purchased at very high rates from surrounding villages. This was, of course " an arrangement " between the local headsman and the local governor to avoid controlled prices, as only the governor could give the necessary authority for the purchase of wheat direct. An idea of the difference can be gathered from the fact that the controlled price was 1600 Rials or about £13 per ton whereas we were forced up to as much as 5200 Rials. Much good labour was lost from time to time due to the difficulties made by the local authorities over obtaining food. In fact, the Black Market can be said to have started in Persia.

The railway sleepers came from North Persia in the Mazandran area.

They were of poor quality and bad shape and, being very hard, would not stand the use of spikes. Each one had therefore to be augered.

Ballast had to be obtained from a pit at Sabzab and entailed an average haul of 210 kilometres. This, together with the shortage of wagons, resulted in the ballasting being far behind the platelaying, but it was possible to complete a first lift by October, 1942, and before the rains.

An average of 1 kilometre advance per day was maintained for the first 40–50 kilometres of line, and over the remainder this was stepped up to 1½ kilometres per day.

Sundry Works

Station staff buildings were erected at all passing stations, comprising an office, store and living quarters. Permanent way gang quarters and stores were erected every 10 kilometres and at all passing stations.

The type of construction was in sun dried brick walls and floors, with roof of vaulted design formed of Bulies (poles about 4–5 inches diameter) and Chatti covered with a mixture of mud and straw. These buildings were found to be the cheapest form of construction and also extremely cool; we found an average cost was about 1*s.* 3*d.* per cube foot.

At Khoramshar Station buildings, offices, shunters and pointsmens' cabins, a locomotive shed capable of taking six locomotives under cover, together with inspection pits, wheel drop, etc., where constructed.

Water

Watering stations were established at kilometres 40 and 81 and, of course, at Khoramshar yard. Borings were taken, and although water was discovered in reasonable quantity it was too saline to be of use. It was, therefore, decided to supply the intermediate watering points by tank wagons. Pump houses were built, ground storage tanks sunk, and overhead tanks erected on brick piers. The tanks were of 4,000-gallon capacity, and although these were small, we were limited to what was available from local sources. However, as locomotives only required to top up at these stations, it was sufficient.

For the water supply at Khoramshar a 4-inch main was laid from the river to a point in the yard, and ground tanks and overhead tanks (10,000-gallon capacity) were erected.

Communications

Telegraph, control, and station to station, lines were erected on wooden poles, except in the areas liable to flood there precast concrete was used.

Main Line Maintenance

Whilst the Ahwaz to Khoramshar line was under construction, more and more problems were arising on the main line. An unusually dry and cold winter followed by a wicked summer caused unprecedented drought. It was found that there was insufficient water to supply the locomotives for the specified twelve trains a day and it became necessary to instal 40 miles of pipe and to construct a dam before a sufficient supply was obtained. Persia is not an easy country in which to find water. The railway traverses desert, mountains, salt lake and volcanic foothills and when water was found, the odds were against it being suitable for locomotives even after softening.

Eventually it was necessary to instal six pumping stations with water softening plants and, in addition, reinforced concrete workshops and locomotive sheds and hutted camps were erected at some half a dozen points.

Other major works carried out included some 200 miles of track, base depot

installations and six deep water berths constructed at Bandar Sharpour and five deep water berths at Khoramshar, the former of screw piling and the latter completely of timber.

Tanuma Extensions

Just as everyone thought they had stood all they could in the way of work, heat and flies, the situation in the Caucasus took a turn for the worse and it became necessary to connect the Iraq base with the Persian Lines of Communications. An order was received in the middle of June, 1942, to build an extension from the Ahwaz–Khoramshar line to Tanuma a distance of some 40 miles, and that it was to be completed by the end of September. The main object behind the scheme was to facilitate the use by Persia of the Basra Base Depot. The project was to include the construction of a Sheet Piled Basin to take lighters and " Z " craft.

A location survey was made of several alternative routes and instructions to proceed with the work were given in the middle of August. Every effort was to be made to complete by the end of September. We had been promised a mechanical equipment company, but as there were no signs of its being forthcoming, it was decided to call for tenders from local contractors for the earthwork. This was done, and the contractor commenced work at the end of August with a penalty and bonus clause to complete by the 30th September. No sooner had he arrived on site than the mechanical equipment company also moved in. It was decided not to terminate the local contractor's contract but to start him working from Kilometre 81 and the equipment company from Tanuma. It was as well that we did so for in spite of the information that the latter could do 2 miles per day, they had only done 3½ miles when the civilian contractors using hand labour only, met them. The total distance was 31 miles and of this the contractor had done 27½ in twenty-six days, a remarkable feat considering his administrative difficulties in obtaining labour in the first place and then the provision of food and water for it.

There was a slight fall from east to west and cross relief culverts were put in at 300 yards centres, to guard against " backing up " from storm and flood water.

The culverts were formed of 12-inch and 24-inch diameter pre-cast reinforced concrete pipes, these were made by us in the stores depot and run to site by rail and were laid on a concrete bed with concrete wing walls.

Permanent Way

It was decided to carry out the whole of the platelaying, culverts and bridges, with military personnel. For this purpose No. 106 Railway Construction Company, Indian Engineers were moved into camp at Kilometre 81. At the end of one week only ¼ mile per day progress had been made and No. 138 Railway Construction Company, Indian Engineers were, therefore, immediately moved to Kilometre 81 to assist. This still did not produce the necessary progress. There is a large proportion of ineffectives in an Indian Construction Company. Out of a strength of approximately 350 per company, around 140 only were employed on permanent way work, for unlike British units, trades other than platelayers would not work on the track. This meant that a large proportion of the unit did nothing ; every effort was made to break this down but without success. The work was therefore slowed down, not because of lack of platelayers, but for lack of carrying and unloading parties.

Progress was also affected by the fact that rails were arriving in odd lengths and had to be unloaded at Kilometre 81, sorted and stacked, prior to reloading

and running out to site. These difficulties were got over by fixing a schedule of prices with the earthwork contractor on a tonnage basis to :—

(1) Off load, sort and stack rails.

(2) Reload and unload on site and carry forward.

In addition, to make up for lost time, low loader pipe carrying lorries were borrowed from the Anglo-Iranian Oil Company and rail and sleepers run out by this means and work commenced at two or three points in addition to rail head. This at last, produced the results required and progress was raised to 2½ miles per day, and the line reached the Terminal at Tanuma on Octobe 4th, 1942 ; this was well in advance of the completion of the basin.

It was decided not to ballast the track but to earth pack it forming a cross drain between every third sleeper. This stood up very well. An experiment was made on a short section of line as follows :—

It was considered that as the soil was of a loose sandy nature there might be a risk of the bank blowing away during high winds, and to obviate this risk, the top of the bank was treated with a mixture of heavy oil after final packing and slewing. Care was taken to avoid the oil getting on the rail, but although no reports are to hand as to how the track had stood up under heavy traffic, the immediate results appeared to be satisfactory.

The terrible conditions under which the British troops worked were never really appreciated. The temperature for many days on end was 132° in the shade. In spite of every precaution that could be taken 36 men among the construction units died of heat stroke.

Accidents

During the period when all the foregoing construction work was in hand the main line was continuing to operate at ever increasing tonnage. Life was made more difficult by a very serious accident which took place in June, 1942. A 600 ton petrol train crashed in a tunnel, the leading engine was driven by a very young British crew and the rear engine by a very old Persian crew. The speed limit was 40 kilometres per hour, the young British crew decided they could do 70 miles per hour. They couldn't ! The Persian crew lost their heads, put on the brakes when on a bend, the train came off, tore up one mile and a half of track, and some 40 petrol tank wagons leaking octane fuel were jammed tight in the tunnel. The Persian engineers inspected the job and went home saying it would take three months to clear, a British construction company was moved in and, taking every risk, even to using oxy-acetylene cutting plant in the tunnel, cleared the debris, relaid the track and had the first train through in three days.

Tabriz Line

A further interesting task was the reconnaissance of the proposed line to Tabriz to join up with the Russian system. The Persians had carried it through to a point some 250 miles east of Tabriz. Our task was to decide time, material and labour required to complete, and in addition, to explore two alternative routes ; it was decided that to complete would take two to two and a half years ; and that the alternative routes were not suitable. Therefore, the line was pushed through for a further 70 miles and a road/rail transhipment terminal established at the town of Mianeh. The main difficulties in the way of developing this line were the damage and sabotage carried out to plant, installations, bridges, etc., by the German contractors who had been working on the line.

On the way back, the reconnaissance party was picked up by Russian Army

units and spent two days in custody in spite of being armed with every possible pass and authority, the trouble being the inability of any of the Russians to read their own language.

Second Front Preparations

In 1943, my sphere of activities was switched back to Britain and I rejoined Combined Operations for planning and training in connection with the Normandy landings. It was during this period that we first considered the possibilities of an artificial port and in June, 1943, Arromanches was selected as a possible site. From that time forward, many of us knew that unless the Supreme Commander, when appointed, made a change, Normandy beaches between Arromanches and Ouistran would be the scene of the British landings. We found it difficult not to say anything when, during those twelve months, we heard wild speculations as to the location of the landings.

We prepared what was called a " Phased Programme " which was really a glorified Bill of Quantities. It contained every article of stores and equipment required no matter how small and it was necessary to break down the quantities against each item on a daily basis over the first six months.

The next phase was to get the troops accustomed to working under fire, and this was done on the West Coast of Scotland, when invasion tasks were reproduced under active service conditions. Live ammunition was used and we had our casualties, but when the day came many found the " First Night " less terrifying than the " Dress Rehearsals."

" *Mulberry* "

After many weeks engaged on preparation, design and construction of Mulberry, in April, 1944, a move was made to two centres, one at Ryde, Isle of Wight, and the other Selsey, where the Mulberry equipment was concentrated and the finishing touches were put to our preparations.

The troops detailed to construct Mulberry were designated " The Port Construction Task Force " under the command of a Brigadier and were divided into three parties :—

(1) The Advanced Recce., hydrographical survey, mine clearance and demolition parties.
(2) H.Q. and main advance party of one company.
(3) Remainder of Task Force.

The adventures of the second two parties have to be left out of this address as I embarked on D—2 in command of the Advanced Recce. Parties, and when next we saw the others we were all firmly established on the continent.

The recce. parties' task was to clear beach mines, demolish anti-tank and sea walls, complete a hydrographical survey and select revised alignment for the piers. The original alignment had been chosen after careful study of charts and details provided by those who had crossed to France in the months preceding D Day and returned with information regarding beach conditions, under-water obstacles, etc. It was, however, considered that some modification would be necessary—all the foregoing tasks were to be complete by D+2 as the first tows were scheduled to arrive by D+3.

It was decided to base the survey on a three-point fix using a radio station as one and two churches as the others. The R.A.F. and Navy and our own gunners assured us we were optimists, and that none of these would be standing, but they proved to be wrong.

Whilst on the subject of hydrographical survey, I would like to pay tribute to the Institution Librarian for his admirable restraint when asked for a book

on Hydrography about D—7 ; that book(2) went with us—I hope no library rules were broken—and it is now back in the library unharmed.

The information given us was that we must be prepared to construct the pier whilst under shell fire up until D+4, a counter battery officer was attached to us, who cheered us all by saying " well ! if you are shelled we can't do much about it, but I can promise you our sympathy."

However, as is always the case, things did not turn out as badly as we expected, and the tasks allotted were completed by the night of D+2. The first tow arrived on D+3, and thence forward there was not much time to spare. In spite of having losses in transit, sufficient equipment arrived to enable one stores pier to be completed and working by D+10.

Once the assault was over, all went well except for a diversion on D+2, when a report was received on the beaches to the effect that some 1,000 German infantry and 10 tanks had broken through. These orders were followed by a warning order to be prepared to re-embark ; it was decided by the Royal Engineers to divide the number of troops reported to have broken through by ten, forget the tanks and lose the order dealing with re-embarkation. Construction work ceased and defensive positions were taken up. About noon firing commenced on our right flank, after which a pleasant afternoon's sport was had by all, ending up with the capture of a goodly number of prisoners and by early evening, Royal Engineer troops were back at work, all rather pleased with themselves.

The storm which broke along the beaches on D+13 was a nightmare, for all movement across the beaches ceased and Mulberry remained the only point of entry for stores and equipment.

One of the greatest difficulties was that the Mulberry piers looked so much more solid than they really were. During the gales large numbers of craft saw in them a haven, and more damage was caused by vessels smashing into the piers than by the storm itself. Many of the pierheads at anchor awaiting fixing were seriously damaged. Pontoons known as Beetles were holed and started sinking, the steel roadway sometimes rose as much as 6 or 7 feet on the waves, and though it was impossible to walk down the roadway, lorries continued moving throughout the gale.

The loss of the American Mulberry really saved the British Harbour, for news of its loss arrived just when the sappers working on the piers had done thirty-six hours without rest or sleep and were beginning to give in from sheer fatigue. The fact that the Americans had lost theirs gave us the incentive to keep going, and in the end most of the men working the piers had no rest for seventy-two hours.

The two stores piers and the vehicle pier were finally completed with the help of equipment salvaged from the American Sector.

The Break Out and Pursuit

The next phase of the operation was the break-out and pursuit. Very briefly, as you know, Second Army went through whilst the First Canadian, with whom I was now serving, moved up from Caen, through Falaise, across the Seine in the Rouen area and into Dieppe, and from there on to clear the Channel Ports.

We were engaged almost entirely on forward engineer reconnaissance, particularly in connection with the rapid opening up of railways, ports and inland waterways.

(2) Land and Marine Surveying. By W. D. Haskoll.

In the case of all the larger ports, river crossings, etc., what was known as a "First Key Plan" for rehabilitation was prepared based on aerial photographs and intelligence reports; estimates of materials, plant and units required were prepared and held in readiness.

These key plans were checked by the advanced engineer reconnaissance parties, generally these recces were carried out whilst fighting was still going on in the vicinity. Immediately the situation permitted the engineer units were called forward by the recce. party and a corrected version of the key plan sent back to G.H.Q.; this method enabled a very rapid start to be made on work. In Dieppe, for instance, the town was captured in the morning, the recce. party completed its first rapid appreciation by mid-afternoon, the first company arrived that night and a start on clearance was made next morning.

These advanced recces provided information of the utmost importance, but some unpleasant experiences for the members; for instance, a walk through a railway tunnel 1½ miles long, which was known to be mined and booby trapped and was reported to contain enemy as well. Nor can the climbing of an 80-foot Silo, and on reaching the top to find the enemy only 200 yards away across the canal, be recommended.

One of the most important engineering tasks during the advance was the speed with which temporary repairs were made to the Ghent-Ternauzen Canal and its lock gates. Landing craft were brought round from Ostend by rail, then up the canal, and slipped out into the Scheldt to carry a brigade of the 52nd Division across to the assault on Beveland. The German commander, after capture, admitted that the attack on his flank came as a complete surprise; they had considered that the canal could not be opened for at least two to three months and as no craft had come up the Scheldt, they had assumed they were safe from a sea-borne attack. The actual time taken to clear the canal and gates was twelve days.

War always produces a series of incidents which leave a lasting impression on the mind. These are regrettably more often than not connected with unpleasant experiences, but this is not always the case, as was shown by two events which occurred during the first few days of September—the liberation of Dieppe and Antwerp. We entered Dieppe on the morning of September 2nd with the Canadians, for whom this was a great occasion. Their order of battle had been drawn up to enable the Canadian 2nd Division to capture the town. This Division was the one that gained fame during the 1942 raid. Our task was to carry out a reconnaissance and open the port as rapidly as possible and, in addition, to open up the railway from the port to a railhead at Neufchatel.

Experts had given their considered opinion on Dieppe as a port of supply some weeks before and their estimated maximum capacity was 600 tons per day. The supply situation was serious, Mulberry was a long way behind, and the Seine with its bridge limitations between us and our only real harbour. We, in the Canadian Army, had never accepted 600 tons as the upper limit for Dieppe and just before the engineer advance and reconnaissance parties left, the D.Q.M.G. and Chief of Staff of the Canadian Army told us that they were not interested in the difficulties of which they knew there were many, but that somehow, some way, Dieppe must be made capable of handling 6,000 tons per day within four weeks. How this was done would be a book in itself, but it is sufficient to say that with the help of some bad mistakes by the Hun in his demolitions, a capacity of approximately 6,200 tons per day was achieved within the specified time. The value of this can hardly be over-

estimated in view of the fact that Antwerp was not opened until December 18th.

It was in Dieppe we came across one of the typical examples of French resistance, not organised resistance but the efforts of individuals, conceived and executed on their own initiative. Briefly, the story was this. The railway from Dieppe was not connected to the main route which was being developed and, therefore, if the line to Neufchatel was to be opened, it was essential that locomotives and rolling stock should be found in the Dieppe area. This was considered to be unlikely. On inspecting the railway locomotive sheds and workshops immediately after capture, we found some ten locomotives in various stages of " dis-repair," and according to the records none could possibly be back in service under three to four months. An ancient Frenchman conducted us round and watched our faces getting longer. At last he could contain himself no longer, and said " Cheer up my friend, these records are for the Boch, you shall have six locomotives back in service in two days." He, his son and grandson who were locomotive fitters, kept their word and the locomotives were ready. They had buried most of the missing parts nearby.

A few of us were pulled out from Dieppe for two days to rush north as the capture of Antwerp was imminent. The reception accorded us on entering, in company with the 11th Armoured Division, was something to be remembered, but as the enemy still held the northern portion of the port and the Scheldt approaches, we returned to the Canadian Army and continued with them to the capture of Calais, Boulogne, Ostend, Zeebrugge, the Breskyns peninsular and into Holland.

At this stage, there ended for some of us one of the happiest periods of the war. Our association with the Canadians came to an end in October and we returned to Antwerp to co-ordinate the reconstruction and operation of the port. Our arrival roughly coincided with the first V2 rocket.

Briefly, the works to be undertaken were the repair of the main lock gates, this necessitated repair of three main gates and the removal of one which was damaged beyond repair, overhauling several hundred or more wharf cranes, erection of twenty new wharf portal cranes, repairing warehouses, workshops and main quays, together with railways and roads.

We used some 3,000 engineer troops drawn from Port and Railway Construction companies, Port Operating and Maintenance Companies and Inland Water Transport companies, together with Belgian civilian labour. The latter supported us magnificently and we had few labour troubles, although on one occasion when a dead-lock occurred, we sent for the labour leaders direct and by telling them the situation and what a continuation of the strike would mean, obtained their immediate agreement to a return to work. To their credit, they never came out again. A point of interest, however, over the employment of local labour was that during the V bomb attacks we had to pay civilian labour " Danger Money," but they earned it, for in just about five months some 6,000 V1's and V2's landed in the Antwerp area. The cost to our troops was heavy. We had more casualties among our own units during this period than in the rest of the operations from D Day to VE Day inclusive.

In April and May of 1945 certain units from Antwerp were detailed to prepare for the relief of the Netherlands. However, this subsequently proved

to be a much less difficult operation than was originally thought, and we were therefore moved up into Germany.

Our work in Germany can really be divided into two phases. Phase I: A reconnaissance of all engineer installations to ports, rivers and canals in the British Sector, followed by the preparation of a detailed plan for the repair, clearance and opening of the major ports of Hamburg, Lubeck and Emden, the Rhine, Dortmund-Ems Canal and other subsidiary ports, rivers and canals.

Also during Phase I, a start was made on the de-Nazification of the German organisations and the locating of engineering records and plans, many of which had been removed and hidden.

Phase II: Covered the putting into execution of the immediate works in accordance with staff requirements: of these the most important were the clearance of the Rhine and the opening of the Port of Hamburg, and the repair of the Dortmund-Ems and the Rhur Canals.

It was necessary, in the early stages, for practically all the work to be undertaken by British troops, but gradually more and more use was made of German labour. The great difficulty was that they seemed to have little desire to help themselves.

A thing which amazed us on entering Germany was the wanton destruction carried out by the Germans themselves. This destruction in many cases could have had no effect upon the military situation or in prolonging German resistance. It only resulted in serious disruption of the German economic life at a later date. A typical example of this was the almost total destruction of the Minden Aqueduct.

The clearing of gaps through the demolished Rhine bridges to permit navigation was a major engineering undertaking. A great use was made of explosives, particularly depth charges for the purpose, and by December, 1945, an average daily tonnage of some 18,000 to 20,000 was being moved down the Rhine from the Duisburg area. This tonnage was made up chiefly of coal.

One of our most difficult tasks during the last six months had been the quadri-partite sub-committees meeting in Berlin. These committees are the technical advisory bodies to the main committees of the Control Council, and briefly, their task is to deal with matters which are of an inter-zonal nature from the technical standpoint. The four occupying powers take the chair in rotation. Considering the conflicting interests and language difficulties of the various members, the committees did much useful work and achieved finality on many points. In an address such as this, politics either parochial or international are out of place, but it is impossible not to mention the fact that one gained the impression that some of our friends argued for argument's sake and the utterances of the British representatives, however simple and honest, were regarded with the gravest suspicion.

In conclusion, I would like to say that during the 6½ years of war, I have had a considerable number of members of the Institution under my command, and I found them, without exception, versatile, efficient, capable of handling any task whether of engineering or soldiering, and above all, never overawed by the magnitude of the project.

The PRESIDENT said that in order that the greatest benefit might be derived from their experiences, as well as those of Colonel Mais, the proposer and seconder of the vote of thanks had been asked to do a little more than formally propose the vote of thanks; they had been invited to relate their own experiences as well.

Colonel R. R. Ware, M.A. (Fellow), in proposing a vote of thanks, said Colonel Mais had had the distinction of playing an important part in two of the greatest military operations in history, *i.e.*, the defeat of the Germans at Stalingrad (which was largely brought about because of the supplies taken over the railway constructed in Persia) and our landing in Normandy on D Day.

Nobody could have listened to Colonel Mais without reflecting that the Chartered Surveyors' Institution had an important part to play in the life of the country in war as well as in peace. Colonel Mais belonged to that intelligent section of the Institution which really knew something about surveying, but he himself belonged to that small, but he hoped lively, section to whom the hayseed was a more appropriate emblem than the theodolite !

The connection between agriculture and military operations was not a very obvious one and it might be a surprise to many to learn that agriculture played an appropriately modest part in the D Day operations of which Colonel Mais had spoken.

During the early part of the war he was with the Lands Branch at Northern Command, and in 1943, he was sent for by the War Office and offered the somewhat mysterious job of Staff Officer, Grade I., with COSSAC, which subsequently, on the arrival in Europe of the Supreme Allied Commander, became SHAEF. He attended a course at the Civil Affairs Staff College at Wimbledon and took up his appointment, still, he was afraid, entirely mystified as to the nature and extent of his duties. He was soon to learn that they had what was called " a very wide scope."

SHAEF at that time was responsible for the greater part of France, the Netherlands, Belgium, the greater part of Germany, Denmark and Norway. As the various operations were considered it was the task of his section to plan the amount of food that would have to be taken in the form of relief stores, and also the agricultural equipment which would be necessary to enable the inhabitants of the various countries to grow more food. As the dates of the various operations varied, and as, of course, the amount of food it would be necessary to take into any country depended on the date of the operation in relation to the harvest, the permutations and combinations were almost infinite and the section was kept very busy.

The authorities decided that fisheries should not be separated from its familiar stable companion, agriculture, and he blushed to confess that he had lectured to an audience of American officers on deep-sea fisheries, a subject for which he was equipped by very little else than an affection for " Captains Courageous " and a taste for trout fishing ! Although he received many kindnesses from many American officers, there were moments when he was glad that the Atlantic was as wide as it was !

In due course he got down to the serious planning for D Day and had to work to a phased plan, much as Colonel Mais had described. It was necessary to plan how much food had to be taken into the various Departments of France as they were liberated by successive phases of the operation. It would give some idea of the thoroughness with which that operation was planned when he revealed that all the relief food and things such as tractors were packed and loaded in America several months before the invasion began and were actually unloaded on the days which had been specified for them in the plan.

Unfortunately, he was not to see how the plan worked out in practice because just prior to D Day he was transferred to the German Planning Unit of SHAEF and immediately commenced to plan for Germany. At that time

he was also one of the two SHAEF representatives—his colleague was an American—on the Combined Working Party on Food for Europe. That was an international body consisting of representatives from Great Britain, U.S.A., and U.S.S.R., with SHAEF representatives as well. Its task was to calculate what quantities of food would be required in every country in Europe when it was liberated. He was afraid that he learned a great deal more than he contributed, but the working party did some very useful spadework.

It was rather more difficult to plan for Germany than for France because there was not access to the same sources of information. There was not the slightest difficulty in obtaining all the information that was wanted in the case of France—copies of the latest agricultural statistics and so forth—but, in the case of Germany it was necessary to rely very much more on statements made by the German Minister in the Press, and so forth, and those, of course, might have been calculated to deceive either the German people or their enemies.

On this occasion he was luckier and was able to see how the plan worked out in practice. In March, 1945, the Allied Forces were in occupation of a small strip of the North Rhine Province. He went over to Germany and was able to see what was happening. The area was not, of course, large enough really to get things going, but the people from 21 Army Group who were there had done a very good job in saving stock from the firing area, and in collecting all that they possibly could in the way of agricultural supplies.

In May, 1945, he was seconded to 21 Army Group and took on an executive responsibility, which was an extremely interesting job. In Germany, the problem of rationing was rather different from that in England. In England, even during the war, we got in a very large part of our supplies by way of imports and were able, so to speak, to lock them up in a cupboard and issue them as required. In Germany, during the war and before it, they were 85 per cent. self-sufficient, which meant that practically all their food had to be collected from some 3,000,000 farms or smallholdings, because most of the farms were very small. Therefore the link between food and agriculture was naturally very much stronger than in England because the main problem was really that of collecting the food from the farms. When the Nazis came into power in 1933 they immediately put into effect a very good food and agricultural policy, which received its coping stone in 1939 when they added a rationing system. That system worked very well during the war and there was less of a Black Market in Germany than in practically any other country in Europe. The system, however, began to crack during the last winter of the war under the impact of the Allies bombardment from the air, and by the time we got into Germany the whole thing had broken down completely. At the same time, Germany had committed national suicide. Every bridge was blown and the inland water transport system was out of action. At first, the railways were out of action too, but they were got going remarkably quickly. Road transport was practically non-existent and the fishing industry—for which he was still responsible—was at a standstill. The great timber industry—which was so important in Germany and which was also the responsibility of his section—was also at a complete standstill.

As members could imagine, his section had a very busy time for the next two months and their experiences were many and varied. They had to deal with the basic economic problem, which was that the Western Zone of Germany for which we were responsible, depended for its food supplies very largely on the Eastern Zone, but that Zone was in the hands of the Russians and supplies

were cut off. The fact that Germany was 85 per cent. self-sufficient before the war had very little bearing on the situation in the British Zone, which was very far from being self-sufficient. In fact, the position was comparable to that which normally prevailed in this country. In addition to that, there were other abnormal problems to be dealt with. We took over the Ruhr area from the Americans early in June, and were told there was not even a week's supply of food left. The Ruhr had a population of about 6,000,000, and normally was supplied on a system which provided for large buffer depots from which food could be issued if the normal supplies ran short. All those supplies had been dissipated. For a long time he had to run trainloads of live cattle down from Schleswig because there were no refrigerated cars, and he could assure members that to do that in a country which was in the state of disorganisation in which Germany was was a very tricky matter. As a matter of fact, he had two officers engaged on doing that alone. In addition, he had to feed about 2,500,000 of the German Army who were disarmed and concentrated in certain areas in the north and who constituted, so to speak, a new and enormous town. There were also about 1,500,000 displaced persons of assorted nationalities to be fed. Finally, as a sort of last straw, when we took over our sector of Berlin from the Russians, we were asked to feed another and rather fluctuating population of from 1,000,000 to 2,000,000. The reason he said from 1,000,000 to 2,000,000 was because we had to take over responsibility for the French sector as well as for our own, and also the responsibility for certain commodities in the American sector.

All those difficulties were overcome. It was a matter for some disappointment that the world food situation had led to the loss of some of that ground which was then rather painfully gained.

One was rather apt to make the mistake of thinking that our occupation of Germany was purely the occupation of the country of a defeated enemy. The truth of the matter, however, was that we had in our Zone of Germany the key to the whole economic situation of Western Europe, and had, in consequence, a great responsibility. One thing he learnt was that coal and food were mutually dependent. The great problem the whole time was that nothing would work without coal. Trawlers could not go to sea, trains could not run, sugar beet could not be turned into sugar, refrigeration plants could not function and butter could not be made on a large scale without coal. The coal could not be obtained unless food in sufficient quantities were sent to the miners in the Ruhr. That problem was a European one; other countries besides Germany were dependent on the coal of the Ruhr for their supplies. It was essential for the problem of feeding the Ruhr miners to be solved if famine was to be avoided in Europe.

He proposed a hearty vote of thanks to Colonel Mais for his most interesting address.

Lieut.-Col. W. R. BRACKETT, O.B.E., T.D. (Fellow), in seconding the vote of thanks, said the meeting had listened to a fascinating address by Colonel Mais on his brilliant and interesting series of experiences whilst engaged on two of the most interesting jobs that could come the way of any chartered surveyor—jobs in which he was not only using his technical knowledge and ability but jobs which had a direct bearing on operations. Few surveyors had that opportunity. He personally, as a gunner, and not as a sapper or an administrator, although he saw much of interest, met little which used his technical

qualifications in either the military sphere, as in the case of Colonel Mais, or the civil sphere, as in the case of Colonel Ware. However, what he had seen had widened his outlook.

When he was first in the Western Desert, in mid-1941, he saw the New Zealanders bringing up the Western Desert railway, which taught him what really could be done in the way of moving earth if the task were undertaken with sufficient machinery. Conditions in the Western Desert were not good. It was not as hot as in Persia, but it was still pretty unpleasant—rather fly-blown and very dusty. Those New Zealanders were grading, laying and completing railway track at the rate of three miles per day, and locomotives were running over the track 24 hours after laying: an astonishing performance.

A little later on he saw something which provided a vivid contrast. He was in Suez and it seemed a good thing to build an island in the middle of Suez Bay. There was a very convenient coral reef there and guns were wanted on the spot. As the site was under water and was some way from the shore it was not considered to be a fit place for mechanical equipment and therefore the island, 150 yards long and 80 yards wide, was built exclusively by native labour. There were thousands of Egyptians with baskets on their shoulders, running like mad, emptying lighters and coming back for more. They built the complete island in just under five months. That, as it was well over three miles from the shore, was a remarkable achievement. He had often wondered since what had happened to it; it lay just outside the three miles limit!

His only contact with surveying as such was a small compensation case. In the desert country south of the Cyrenaican Hills he wanted a range to shoot over. Reconnaissance discovered an excellent valley, but in the middle of the valley was a small nomad tribe of Bedouin—the ordinary nomad tribe which moved south in the winter as the rains came, having planted their patches of barley, and, as the water holes dried up, moved north again to harvest their crops, knowing perfectly well that no one would have touched them in the meantime. This little sheik was sitting in the middle of the valley, so he went down to see him in order to negotiate. The sheik did not want to move because that was the only water hole for that time of the year, but after discussion it was agreed that the guns would fire until mid-day only and that the tribe could come back for the afternoon. That matter having been settled satisfactorily, the sheik invited them to a feast, and did them very well indeed. It should be said, however, that the bowl of milk which had to pass communally amongst all would not have pleased the eye of any hygienist! The feast was finished with some remarkably good pancakes made with honey, which he had remembered ever since! That was the end of that matter, except that as he was getting into his car the sheik placed in it two sheep, which were most gratefully received. He had often thought how nice it would be if all compensation claims could be settled so mutually satisfactorily!

His only other contact with the surveying world was when, getting back from the desert on leave, he ran into the then President of the Institution in the hall of Shepheard's Hotel in Cairo. The President was flying back the same night and expected the journey to take four days, which seemed very quick, because even at that time letters were taking over three months to reach the Middle East from home.

He had seen little of surveying as such but in one way and another he saw

a lot which opened his eyes as to what could be done by people of vision. That applied particularly to town planning. In Turkey he saw the new capital Ankara—a city built in the barren wastes of the Anatolian Plain by a man of vision, Kemel Attaturk. Kemel Attaturk decided he would have a capital there—in what was, in those days, a treeless wilderness. It was said that he asked some experts where trees would not grow ; they showed him a hill and told him trees would not grow there. Kemel Attaturk thereupon told the experts to plant a million trees on the hill. They did, and the trees were growing there now ! Turkey was a poor country but the Turks had somehow managed to provide themselves with a capital which worked well and which was strikingly impressive. Travelling by the Taurus Express—which was the only way to get there, because the roads in that part of the world were not crossable—one arrived at the station—a perfectly straightforward, clean looking station, but spacious and with tremendous dignity. That made one feel ' This must be a good place.' One came out of the station and up the drive into the centre of the city, and the further one went the more one was impressed with the efficiency, the simplicity and the taste of the whole thing. It would be very nice if we, with all our resources, had in the last one hundred years built even one town to do us, artistically and commercially, the credit which Ankara did to the Turks. They had not forgotten the humanities either, for Kemel Attaturk, who appreciated the good things of life, decided that he must have the best restaurant in the world and therefore built one. It was State subsidised and was very good.

An interesting contrast was provided by Damascus and Jerusalem. Damascus had, of course, been under French control for some time, and to the ancient city the French had added a new one. They had grafted the new on to the old in a way which was most deceptive ; one did not realise it was either, old or new. To him the whole place was fascinating and beautiful. Jerusalem on the other hand, consisted of an immensely old city with a new city built alongside it, in vivid contrast. There was no intermingling. The character of the old city had been preserved but somehow the net result was far less satisfactory than in the case of Damascus. The new, in comparison with the old, had the slightly unpleasant effect of the over-cleanliness of a white glazed brick !

Other developments were equally interesting, such as in Cyrenaica—once the granary of the classical world but whose production fell away to nothing. That had been tackled by the Italians, who colonised mostly on a smallholding basis. They built little model homesteads, all distressingly alike. They were so designed that the production of each holding was likely, after meeting the mortgage charges, to leave a sufficient income for the smallholder to live on. That scheme was a very good one and had it not been disturbed by political factors it might well have done much good for the country. The farms were well looked after, for the Italian as a smallholder was a good cultivator. It was to be hoped that we would be able to restore that country to the pitch of production it achieved in Italian hands. Good as the agricultural development was there, there was a marked contrast with what might be called the political side. The Italians built model civic centres for each little district. They were gleaming and white, but very inhuman. Each had its church, its jail, its little Fascist office and its small municipal office, but nowhere was there a pub., a cinema or—except in Benghazi—a theatre or any sort of place of amusement. The devoted Fascists who went there must, he was afraid, have

had little relaxation in the small amount of time they spent away from their holdings.

After a gap like that, it was strange to come back to one's original profession. Those who had had the good fortune to use their professional experience during the war would not find the gap as difficult to bridge as would those who, like himself, had been serving as regimental soldiers. He wished to express his appreciation of the way in which the College of Estate Management, under the ægis of the professional bodies, was providing refresher courses. He did not think the average surveyor who had been in the Services for some time needed much in the way of education other than some refresher course to get him in touch with prices, and so on. Where he did need help—particularly if he were in private practice—was in re-establishing those contacts which made it easy and possible for him to work. The refresher course aspect was admirably centrally organised but the problem of putting the surveyor in touch again with all his old friends and clients was one which could not be organised centrally. The greatest kindness which the individual member of the Institution could do to the returning serviceman was to help him to look up all his old friends, both professional and personal, again and thus enable him to take up the position which he left years ago.

He was afraid that his own war experiences were very dull when compared with the exciting, stimulating and important job which Colonel Mais had done, yet he felt he had benefited by them in that his outlook and knowledge had been broadened. He seconded the vote of thanks for a most able and inspiring paper.

The PRESIDENT said that after those speeches, discussion would, he thought be an anti-climax. The standard of eloquence of the three speakers had been exceptionally high.

The credit for the idea of the meeting was due to the Principal Assistant Secretary, Mr. Evans. He thought that fact should be recorded, because the result had been so satisfactory.

The most appropriate, and possibly the only comment he could make, was that this team of three chartered surveyors represented an interesting cross-section of the activities of the members of the Institution and their contribution to the war effort.

He moved that the vote of thanks should be extended to all three speakers for having made the meeting so outstandingly interesting.

The vote of thanks was carried with acclamation.

Colonel MAIS, in reply, said he had undertaken the address with a great deal of fear and trepidation, and when he heard some of the people who would attend the meeting, he was even more worried! He was grateful—and so, he was sure, were Colonel Ware and Colonel Brackett—for the opportunity to tell something of what he had been doing during the last 6½ years to show that at least he had not been wasting his time.

He thanked the Institution for the kindness and help he had received prior to coming out of the army and since coming out. Every possible help and assistance had been given him to enable him to become re-established. In fact, he did not think he would have come out had there not been such a welcome waiting for him.

The proceedings then terminated.